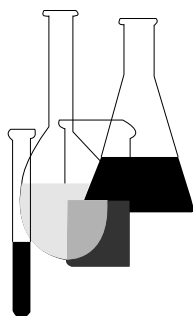




Ecological Effects Test Guidelines

OPPTS 850.4025 Target Area Phytotoxicity



“Public Draft”

INTRODUCTION

This guideline is one of a series of test guidelines that have been developed by the Office of Prevention, Pesticides and Toxic Substances, United States Environmental Protection Agency for use in the testing of pesticides and toxic substances, and the development of test data that must be submitted to the Agency for review under Federal regulations.

The Office of Prevention, Pesticides and Toxic Substances (OPPTS) has developed this guideline through a process of harmonization that blended the testing guidance and requirements that existed in the Office of Pollution Prevention and Toxics (OPPT) and appeared in Title 40, Chapter I, Subchapter R of the Code of Federal Regulations (CFR), the Office of Pesticide Programs (OPP) which appeared in publications of the National Technical Information Service (NTIS) and the guidelines published by the Organization for Economic Cooperation and Development (OECD).

The purpose of harmonizing these guidelines into a single set of OPPTS guidelines is to minimize variations among the testing procedures that must be performed to meet the data requirements of the U. S. Environmental Protection Agency under the Toxic Substances Control Act (15 U.S.C. 2601) and the Federal Insecticide, Fungicide and Rodenticide Act (7 U.S.C. 136, *et seq.*).

Public Draft Access Information: This draft guideline is part of a series of related harmonized guidelines that need to be considered as a unit. *For copies:* These guidelines are available electronically from the EPA Public Access Gopher (gopher.epa.gov) under the heading “Environmental Test Methods and Guidelines” or in paper by contacting the OPP Public Docket at (703) 305-5805 or by e-mail: guidelines@epamail.epa.gov.

To Submit Comments: Interested persons are invited to submit comments. By mail: Public Docket and Freedom of Information Section, Office of Pesticide Programs, Field Operations Division (7506C), Environmental Protection Agency, 401 M St. SW., Washington, DC 20460. In person: bring to: Rm. 1132, Crystal Mall #2, 1921 Jefferson Davis Highway, Arlington, VA. Comments may also be submitted electronically by sending electronic mail (e-mail) to: guidelines@epamail.epa.gov.

Final Guideline Release: This guideline is available from the U.S. Government Printing Office, Washington, DC 20402 on *The Federal Bulletin Board*. By modem dial 202-512-1387, telnet and ftp: fedbbs.access.gpo.gov (IP 162.140.64.19), or call 202-512-0135 for disks or paper copies. This guideline is also available electronically in ASCII and PDF (portable document format) from the EPA Public Access Gopher (gopher.epa.gov) under the heading “Environmental Test Methods and Guidelines.”

OPPTS 850.4025 Target area phytotoxicity.

(a) **Scope**—(1) **Applicability.** This guideline is intended to meet testing requirements of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (7 U.S.C. 136, *et seq.*).

(2) **Background.** The source material used in developing this harmonized OPPTS test guideline is OPP 121–1 Target Area Phytotoxicity Testing (Pesticide Assessment Guidelines, Subdivision J—Hazard Evaluation; Nontarget Plants) EPA report 540/09-82-020, 1982.

(3) **Test objective.** This guideline should be used in conjunction with OPPTS guideline 850.4000, Background—Nontarget plant testing, which provides general information and overall guidance for the nontarget plants test guidelines.

(i) **General.** (A) Target area testing studies are designed to provide phytotoxicity information on a pesticide. These phytotoxicity data are needed to evaluate the effect of the level of pesticide exposure to target area terrestrial and aquatic plants that are not intended to be controlled, and to assess the impact of pesticides on endangered and threatened plants as noted under the Endangered Species Act. Where a phytotoxic effect is noted in one or more plant species, further target area phytotoxicity studies may be required (after consultation with the Agency). These studies are required by 40 CFR 158.150 to support the registration of any pesticide intended for outdoor use under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), as amended.

(B) The target area phytotoxicity studies are unique because the pesticide is being applied in the field using commercial application equipment and typical methodologies. Several factors can affect the degree of possible phytotoxic response. Cultural practices can vary with production areas and frequently from grower to grower within an area. These include irrigation practices, mowing, and field cultivation practices. Method of application can dictate the route of exposure of the pesticide to the plant, i.e., whether it is by the roots or shoots and leaves.

(ii) **Objective of the target area test.** The objective of the target area test is to determine if a pesticide exerts any detrimental effects to plants during the their entire life cycle. The test is performed on those desirable target area or pest host plant species as listed on the label which will be in the target area. Being a multiple dose test, it is designed to evaluate the phytotoxic effects of the pesticide over a wide range of anticipated pesticide quantities as may be found in the environment.

(b) **Definitions.** The definitions in OPPTS Guideline 830.4000, Background-Nontarget Plant Testing, section 3 of the Toxic Substances Control Act (TSCA), and 40 CFR Part 792—Good Laboratory Practice Standards apply to this guideline. In addition, for the purpose of this guideline, the following definitions apply:

Effective dosage range (EDR) refers to the range of dosage levels beginning with the lowest dosage capable of achieving the level of control specified by the applicable performance standard for the least taxing conditions under which it will be used (e.g., pest levels, soil types, water conditions, geographical and climatological conditions, etc.), and ending at the lowest dosage required to achieve the specified level of control under the most taxing conditions under which it will be used.

Effectiveness refers to a product's ability to control the specific target pest or produce the specified plant or animal response when the product is applied in accordance with the label directions, precautions, and limitations of use. The term effectiveness, as used in this guideline, is synonymous with the term efficacy.

Full coverage, as used in common agricultural practice, refers to a volume of spray applied to plants to the point of runoff or drip.

Large scale plot refers to any plot large enough to permit the use of typical commercial application equipment (when such equipment is needed for pesticide application).

Low volume or LV, as used in common agricultural practice, refers to a total volume of spray applied broadcast as more than 0.5 gal/acre but less than 5.0 gal/acre. (For further information, refer to paragraph (f)(2) of this guideline.)

Minimum effective dosage or MED refers to the lowest dose level at which the test substance achieves the level of control specified by the applicable performance standard.

Performance data refers to any data pertaining to pesticide effectiveness and usefulness.

Serial application refers to the label-recommended use of a pesticide on a site before or after application of another pesticide to that site, such that the presence of one of the pesticides may affect the effectiveness and usefulness of the other.

Ultralow volume or ULV, as used in common agricultural practice, refers to a total volume of 0.5 gal or less per acre (1.89 L or less per hectare). (For further information, refer to paragraph (f)(1) of this guideline.)

(c) **Test standards.** In addition to the general standards set forth in OPPTS 850.4000, the following standards for the target area phytotoxicity testing apply:

(1) **Test substance.** The test substance is to be the end-use product or a representative end-use product from the same major formulation category for that general use pattern. Examples of major formulation cat-

egories are: Wettable powders, emulsifiable concentrates, and granulars. (If the manufacturing-use product is usually formulated into end-use products comprising two or more major formulation categories, a separate study must be performed with a typical end-use product for each category.)

(2) **Test species.** Those desirable target area or pest host plant species as listed on the label (for example, the crop plant or ornamental) which will be within the target area should be tested. The plant cultivars to be tested should include representatives of the cultivars that are most likely to be used.

(3) **Applications levels.** (i) The minimum, maximum (or the greatest allowable concentration), and $2\times$ the maximum label application level or rate should be tested. Levels greater than $2\times$ the label rate may also be included. The estimated nondiscernible effect (or no-effect) level should also be determined.

(ii) The multiples of the application rate to be tested are those various quantities of the formulation in the label-recommended quantity of carrier (such as water) to be used per land or aquatic use area.

(4) **Adjuvants.** Products with labeling which allows or recommends the addition of separately-packaged adjuvants to the spray tank should be supported with data indicating any detrimental effects (such as increased crop phytotoxicity) which may result from their addition to the pesticide, especially a herbicide, plant regulator, desiccant, or defoliant. If a range of adjuvant rates is recommended, the maximum rates within that range should be evaluated in conjunction with the intended pesticide product.

(5) **Tank mixtures.** When tank mixtures are recommended on product labeling, a study may be required on a case-by-case basis to demonstrate the extent of antagonism and synergism with respect to detrimental effects on nontarget plants by the products of tank mixtures. Antagonism and synergism are best evaluated in adjacent plots where possible interactions are subjected to statistical analysis. See OPPTS Guideline 840.1400 for possible combined testing.

(6) **Serial applications.** Data requirements for serial applications of one or more pesticides preceding or following another pesticide on the same crop area in the same growing season are identical to those described in paragraph (c)(5) of this guideline for tank mixes with respect to phytotoxicity, when such serial applications are recommended on the label. See OPPTS 840.1400 for possible combined testing.

(7) **Site.** The test should be performed in greenhouses, field plots, or wherever the product is intended to be used.

(8) **Protocol.** The protocols, methods, or practices should be those employed for the anticipated registered use of the pesticide product. Spe-

cific points of information that should be addressed concerning use patterns, application methodology, cultural practices, responses, and subsequent planting are found in this paragraph.

(d) **Reporting.** In addition to the information required by OPPTS 850.4000, the test report should include the following information with respect to phytotoxicity to the plants within the target area (with the exception of weeds). This information should include the method of application, cultural practices, plant responses, subsequent plantings, and use patterns that may be involved.

(1) **General information**—(i) **Timing of applications.** When crops or desirable target area plants are or will be involved in the application of any pesticide, their stage of growth or development at application should be described in the test report.

(ii) **Meteorological conditions.** Where meteorological conditions cause detrimental effects on plants which in turn allow the pesticide to further adversely affect the plants, the specific factors, such as temperature, wind conditions, precipitation, or day length affecting product activity should be measured and reported. Edaphic factors, such as soil moisture content and temperature, which are directly affected by meteorological conditions, should also be reported. Soil moisture may be observed and expressed in terms of dry and cracked, waterlogged, or other similar conditions. Soil type and organic matter content of the soil should also be reported.

(iii) **Spray dilutions.** In foliar applications, when a pesticide is applied as a diluted spray and the quantity is dependent upon the number of trees per area or density of vegetation, the total spray volume per unit area and the concentration of the applied pesticide should be reported.

(iv) **Untreated controls (checks).** In phytotoxicity evaluations, all treated plots, plants, and/or commodities should be compared directly to untreated control plots, plants, or commodities. All quality and/or yield evaluations of pesticide-treated plants or commodities should be compared to control plants or commodities receiving the same pesticides (e.g., herbicides, insecticides, fungicides) except the one being evaluated. Detailed descriptions of plots and plants used as control treatments for comparisons of detrimental side effects should be included for each test. Since such control plots are established to evaluate any direct detrimental effects of the pesticide on the crop or commodity rather than to evaluate efficacy, any detrimental effects on the crop or commodity resulting from pests should be controlled using nonchemical means. In other words, the control plots should be both untreated by the pesticide in question and as pest-free as reasonably possible. Only captan and thiram seed treatments are currently approved. All other pesticide treatments must be reviewed by

the Agency for antagonistic/synergistic interactions with the test chemical prior to use in the test.

(2) **Use patterns.** When the following use patterns are found on the label, the corresponding information as detailed below should be reported.

(i) **Use in field crops.** Effects of pesticides on desirable target area plants should be evaluated and reported. The extent and duration of the effect should be expressed in terms of stand and vigor, recovery, yields, and degree of phytotoxicity.

(ii) **Use on pastures and rangelands.** Effects of pesticides on desirable target area plants should be evaluated and reported. Severity and duration of adverse effects on desirable plant species, expressed in terms of stand and vigor reductions, recovery, and changes in yields, should be reported. Data should be submitted addressing reseeding intervals which minimize adverse effects on reseeded plants, and animal grazing recommendations which allow recovery of desired plant species. If the applied pesticide kills all vegetation in the treated area for an extended period of time resulting in bare spots, the registrant should record the duration of this effect, estimated soil loss by erosion, and any changes in vegetation cover (desirable or undesirable).

(iii) **Use on and around fruit and nut trees.** Applications of pesticides on and around fruit and nut trees require evaluation and reporting of detrimental effects on foliage, and changes in growth compared to preapplication measurements and simultaneous controls. Pesticide applications to bearing fruit and nut tree areas also require evaluation and reporting of detrimental effects on yields and commodity (produce) quality for the year of and the year after application. Supporting data should address, for all trees, the age of the trees, the transplant-to-application interval, and the maximum allowable extent of contact between the pesticide (with particular reference to herbicide spray drift) and trees. For ground sprays, unless the pesticide is broadcast over the entire orchard floor, data should indicate the application technique (band, spot, shielded, or directed spray application) and the size of the treated ground area around the tree trunk. Assessment of root sucker treatments should be made where applicable. For foliar sprays, the data should include the volume of finished spray applied per unit of land area, concentration of product in the spray solution, and the extent of foliage coverage (such as volume of finished spray per tree or application to the point of runoff).

(iv) **Use on lawns and turf.** Evaluation of effects of pesticides on representative species or cultivars of desirable lawn and turf plants should include such factors as color, density, percent cover, growth rate, rooting, and tillering. If use on bentgrass is intended, this highly susceptible species should be evaluated. Data should address use on newly-seeded lawns by demonstrating safety to representative species and cultivars of desirable

lawn plants to be named on the label as kinds on which the product is safe to use, with seeding-to-application intervals (if appropriate). Data should also address use of an appropriate application-to-reseeding interval for each of these desirable lawn plants that may be reseeded. Interactions between herbicide application and lawn cultural practices (such as raking, mowing, mowing height, watering, and fertilizing) should be evaluated for possible adverse effects on desirable lawn species. In situations where fertilizer and a pesticide are applied serially and both types of products may contact the emerged crop foliage (such as in turf or lawns), the interval between application of the pesticide and the fertilizer should be reported, as well as any resultant phytotoxic effect, stunting, or discoloration, and recovery time for the injured desirable species.

(v) **Use around ornamentals.** Phytotoxicity data in support of use on or around an ornamental should include an evaluation of the sensitivity of representative cultivars of that species. Since it has been documented that cultivars and varieties of the same species vary in their susceptibility to injury, the limited nature of testing should be addressed in product labeling. Test data should identify the method of application as to directed spray and/or topical applications. Growth stage of the ornamentals and the transplant-to-application interval (when applicable) should be indicated in the test data. Information should be submitted on specialized nursery cultural practices employed in tests, such as use of artificial soils, mulches, containerized stock, and other pesticides.

(vi) **Use in forest management.** The effects of the pesticide on desirable plant species commonly present in forest management, in addition to the desirable forest trees, should be indicated in the report with any detrimental or adverse effects that the pesticide may cause. Special attention should be given to pesticidal effects on noncompetitive ground cover species that aid in the land management practices such as erosion control. Appropriate testing and assessment techniques adapted to the size of the plot should be used to determine the effect of pesticides on all plants. (Refer to paragraph (f)(2) of this guideline.)

(3) **Application methodology.** All methods of pesticide application specified on the label should be evaluated and reported. Specific detail as to descriptions of equipment design, adjustment, and operation should be provided in test reports involving aerial applications and applications using conventional farm equipment (such as tillage or planting equipment), irrigation systems, mechanical incorporation, directed sprays, mist blower (air blast, air carrier), subsurface placement, or band rather than broadcast distribution.

(i) **Aerial application.** Guidance and the data requirements for testing aerial applications is provided under OPPTS Series 840.

(ii) **Irrigation system application.** (A) For irrigation system applications, multiple plots and subplots within a treated field should be examined and the results reported for crop phytotoxicity (expressible as yield quantity, quality, and timeliness of harvestable commodity) as an indication of pesticide hazard. Data from such plots should be reported for each individual plot and not averaged together. It is important that, in addition to the standard requirements for conventional applications, submitted data should include soil texture, percent soil organic matter, relative soil moisture content (dry, medium, or wet) at application, acre-inches of water applied, and precipitation quantities within one week after application.

(B) For overhead sprinkler irrigation systems, plots should be placed at both extreme ends of the lateral as well as in at least one area where the sprinkler patterns overlap. On a center pivot, several “pie” sections may be used for treatment subplots in one half with the second half of the plot as the control. The concentration of active ingredient (AI) at several nozzles along the lateral should also be determined and reported.

(C) For surface irrigation systems such as flood, furrow, drip, and surge, the following data should be submitted: Concentrations of AIs in water should be determined for the study plots where the treated water enters the field, and at the lower end of the field or where the water exits. When furrow irrigation is used, data should indicate the spatial relationship between crop rows and furrows. If pest control in furrow irrigation applications is intended only for the furrow itself and not the bed between the furrows, the data should so indicate.

(iii) **Directed sprays.** When sprays are directed toward or away from certain portions of the soil or plants, data should indicate nozzle arrangements, nozzle orientations, the extent of spray contact with soil or plants, and application height.

(iv) **Mist blower applications.** Guidance and the data requirements for testing mist blowers (air blast and air carriers) is provided under OPPTS Series 840.

(v) **Subsurface soil applications.** When pesticides are applied directly beneath the soil surface (injected through shanks or spray blades, or gravity fed), test reports should include information on the application equipment. For example, for injection equipment, the following should be specified: Application device spacing, depth of operation, injection pressure, speed of operation, volume of liquid or gas applied per unit area for general broadcast applications or linear row distance for band and row applications, and the number and placement of injectors with respect to plant rows.

(vi) **Other aquatic applications.** When a pesticide is applied to a natural aquatic system other than an irrigation system, the following application information should be included:

(A) Target site where the pesticide was applied (for example, to weed foliage, to surface of water, to bottom of water body, into (water, to ditchbank, to shoreline, or to forests).

(B) Description of the equipment used to apply the pesticide (for example, ground-spraying device, pumping device, boat, blower, helicopter, or fixed-wing aircraft).

(C) Description of any water level changes used in conjunction with the pesticide application, such as drawdown operation or drainage of conveyance system, including the extent of water level change, the time of the change in relation to the pesticide application, and the duration of the change in water level.

(D) The timing of the application in relation to the calendar date and the stage of growth of the target and nontarget organisms.

(4) **Cultural practices.** Cultural practices for a given use pattern or application method vary with production areas and frequently from grower to grower within an area. The effects of cultural practices on the product's possible detrimental effects should, therefore, be addressed.

(i) **Irrigation.** Irrigation and watering practices should be studied as a variable if the product is to be used in irrigated areas or greenhouses, respectively. The influence of different irrigation practices should be studied in the use area. Irrigation data should include a description of equipment and techniques used in water application, the number and timing of irrigations, and quantity of water in acre-inches (hectare-centimeters) applied at each irrigation. Also, describe the chronological relationship between irrigation applications and application of the pesticide, such as herbicide, plant regulator, desiccant, or defoliant. Where flood irrigation is utilized (such as in rice production), depth, duration, and any "flushing" should be described for each test. When irrigation is used to activate a pesticide in the absence of precipitation, the minimum and maximum application-to-irrigation interval (producing the desired efficacy level) should be reported. Since crop safety is often influenced by pesticide placement in the soil profile, and irrigation may directly affect such placement, label-recommended or label-allowed irrigation practices should be supported by crop safety data (phytotoxicity and yield). When irrigation practices result in loss of pesticide contaminated water (as in runoff or drainage) from the target area, data should be submitted addressing effects of such water on nontarget plants.

(ii) **Mowing.** Mowing operations may enhance detrimental effects from pesticides intended for use on lawns, turf, golf courses, median strips, pastures, rangeland, and hay and forage crops. Mowing just prior to or just after a pesticide application may, by mechanically injuring desirable plants or by decreasing growth rates, increase injury to desirable plants (especially young shoots). Mowing just prior to application may be a re-

quirement for plant regulators intended to maintain the neat appearance of grassy areas by retarding grass growth. In situations where mowing is routinely a part of cultural practices, or may influence detrimental effects, such practices should be reported in test results.

(5) **Target area plant responses.** The detrimental effects on crops, commodities (produce), or any other desirable plant species or commodity within the target area should be evaluated and reported. The following are some of the characteristics that should be addressed:

(i) **Stand.** Crop stand counts, reported as percentage of untreated control crop stands, should be submitted.

(ii) **Vigor.** Crop vigor (or stunt) ratings or measurements (plant height, weight, diameter, or length) in treated areas should be compared to plants in check plots in which commercially acceptable levels of pest control are maintained. Vigor ratings should be reported at the point of maximum stunting. If stunting is observed, it is important that subsequent evaluations be made to document the degree of recovery.

(iii) **Planting depths.** A range of planting depths within the range recommended for the crop should be included in preliminary studies with preplant and preemergence (to crop) applications. Data obtained from these trials should reflect any effects of varying planting depths on the incidence of crop injury that might be encountered under commercial use conditions. In subsequent trials, commercial planting equipment at recommended depth settings should be used. If in preliminary studies the planting depth is found to be a critical variable, crop emergence data should be taken from all trials.

(iv) **Lodging.** The effect of pesticides on lodging of target area crops such as soybean, wheat, corn, sorghum, rice, or sugarcane should be indicated. Observed percent of treated plants affected and the severity or approximate degree of angle of lodging in treated plots should be compared to that in weed-free check plots.

(v) **Phytotoxicity.** Evaluations of visible symptoms of pesticide injury (such as discoloration, malformations, desiccation, defoliation, or death) to crop plants should be at least visually assessed and reported. These symptoms should be compared to results in check plants untreated with the pesticide in question. Evaluations should be performed at the time injury is first observed and at periodic intervals thereafter to document the degree of recovery.

(vi) **Development.** Effects of pesticides on plant development (such as delayed emergence, prolonged vegetative growth, delayed or decreased flowering or fruit set, or delayed maturation) should be indicated in test results. If such effects are outgrown by or before the usual harvest date, such recovery should be reported.

(vii) **Yields.** Effects of pesticides on yields should be reported. Yield data can confirm that there are no lasting detrimental effects on the desirable target area plants due to the pesticide application. Yield data may also be used to evaluate benefits derived from the application. When yields are evaluated in relation to crop safety or phytotoxicity, yields from treated plots should be compared to yields from untreated plots. Comparisons of treated and untreated (control) plot yields, when expressed as weight of seed (grain and dry beans) or hay, should be based upon equivalent moisture contents (percent moisture) acceptable for commodity storage. In the case of weed control, yields from weedy check plots may be reduced as a result of weed competition and may mask crop injury due to herbicide application. Therefore, herbicide yield comparisons should be drawn from the treated plots and weed-free plots. The maintenance of weed-free control plots may be accomplished by some nonchemical weeding practice. When any adverse effects indicated in paragraphs (d)(5)(i) through (d)(5)(vi) of this guideline occur, the ultimate indication of their impact can usually be evaluated at harvest.

(6) **Subsequent planting.** The effects of pesticides on desirable plants subsequently planted in the area within 6 months of application should be evaluated and reported. Subsequent planting may include emergency replanting of crops or trees within the target area where crop failure may have occurred and where the planting of rotational crops (including cover crops) takes place after the harvesting of the crop present during the pesticide application.

(i) **Emergency replanting.** If pesticide labeling states that crops may be safely replanted after an initial crop failure, the submitted data should support: The crops suitable for replanting, pesticide application-to-replanting intervals, additional pesticide applications recommended or allowed, recommended soil tillage, and soil and meteorological conditions under which replanting is or is not recommended. For example, when the original pesticide was applied in bands, as in the case of certain herbicides, replanting may be recommended to take place only between the treated bands.

(ii) **Rotational crops (including cover crops).** If detrimental effects are observed, results of studies evaluating severity and duration of effects on the injured rotational crops should be submitted. To determine the duration of phytotoxic effects, susceptible rotational crops should be planted at varying time intervals after pesticide application. Such studies may be combined with field studies designed to evaluate soil residues.

(e) **Data reporting.** (1) The registrant's report on target area testing studies should include all information necessary to provide:

(A) A complete and accurate description of the greenhouse/field plot treatments and procedures.

(B) Sampling data and phytotoxicity rating.

(C) Data on storage of the plant material, if so performed.

(D) Results of any chemical analysis of the plant material.

(E) Reporting of the data, rating system and statistical analysis.

(F) Quality control measures/precautions taken to ensure the fidelity of the operations.

(2) Each greenhouse/field plot target area testing report should include the following information:

(i) **General.** (A) Cooperator or researcher (name and address), test location (county and state; country, if outside of the United States), and date of study.

(B) Name (and signature), title, organization, address, and telephone number of the persons responsible for planning/supervising/monitoring and, for field plot studies, applying the pesticide.

(C) Trial identification number.

(D) Quality assurance indicating control measures/precautions followed to ensure the fidelity of the phytotoxicity determinations, record-keeping procedures and availability of logbooks, skill of the laboratory personnel, equipment status of the laboratory and/or greenhouse, degree of adherence to good laboratory practices, and degree of adherence to good agricultural practices in maintaining healthy plants.

(E) Other information the registrant considers appropriate and relevant to provide a complete and thorough description of the test procedures and results.

(ii) **Test substance (pesticide).** (A) Identification of the test pesticide AI including chemical name, common name (ANSI, BSI, ISO, WSSA), and Company developmental/experimental name.

(B) AI percentage in the end-use product or representative end-use product. The representative end-use product must be of the same AI and formulation category, but it may be of a different concentration, i.e., 2 percent wettable powder vs. 4 percent wettable powder.

(C) Additional solvents or adjuvants used to dissolve and apply the pesticide if the pesticide is intended for use at aquatic sites and it is insoluble in or immiscible with water.

(D) Dose rates in terms of active ingredient per area of land, water, or leaf (if leaf-area-index is provided).

(E) Dose rates in terms of minimum, maximum (or greatest allowable concentration) and 2× the maximum label application level rate and with an estimated nondiscernible effect (or no-effect) level.

(F) Method of application including equipment type, nozzles, pressure, etc.

(G) Number of applications.

(iii) **Plant species.** (A) Identification of the desirable target area or pest plant species with family identification. Scientific and common names must be provided.

(B) Identification of the number of replicates and the number of plants per replicate per dose.

(C) Identification of the date of planting, dates of pesticide application, and dates of phytotoxicity rating or harvest.

(iv) **Site of the test.** (A) Site description of the target area testing study such as whether it was performed in a greenhouse, field plot, forest, or aquatic site.

(B) Location of the test site, geographically.

(C) Climatological data during the test—records of applicable conditions for the type of site, i.e., temperature, thermoperiod, rainfall or water regime, photoperiod, light intensity and quality, relative humidity, wind speed, etc.

(D) Field lay-out (for field plots), e.g., size and number of control and experimental plots; number of plants per plot/unit area.

(E) Pot (greenhouse only) or row density of terrestrial plants (or their seeds).

(F) The intended use patterns as noted on the label for which the tests are being performed.

(G) Cultural practices such as cultivation and irrigation.

(H) Substrate characteristics for terrestrial uses, including forests, name/designation of soil type and its physical and chemical properties including pH and percent organic matter, soil moisture content.

(I) Substrate characteristics for aquatic uses, including water body type, water chemistry, including pH, hardness, CEC, suspended sediments, benthic conditions.

(v) **Results.** (A) Target area plant responses, including detrimental effects on crops, commodities (produce), or any other desirable plant species, such as stand, vigor, planting depths, lodging, phytotoxicity (includ-

ing a description of the rating system), and yields, to ascertain toxic effects of the pesticide upon the plants.

(B) Statistical analysis of the results.

(C) Other evaluations for the individual use patterns and application methodology, and cultural practices as indicated in this guideline.

(f) **References.** The following references should be consulted for additional background material on this test guideline.

(1) American Society of Agricultural Engineers' Pesticide Application Subcommittee of the Agricultural Chemical Application Committee. Uniform terminology for pesticide spraying ASAE Handbook, ASAE-S327 (Agricultural Engineers Yearbook), p. 313 (1978).

(2) Phillips, E.A. *Methods of Vegetation Study*. NY: Holt, Rhinehart, and Winston (1959).

(3) Little, T.M. and F.J. Hills. *Agricultural Experimentation—Design and Analysis*. NY, Wiley (1978).